

Digital Hydrogeological Model of LLW and ILW Disposal Site in the Kola Peninsula

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Digital hydrogeological model of LLW and ILW disposal site in the territory of the Kola Peninsula has been presented here. Discussed site was recommended by members of Contact Expert Group (CEG) in a year of 2008 as a potential one for underground isolation object disposal of solid radioactive wastes of low and intermediate level of activity [1].

The authors of the article have developed digital hydrogeological model of the site using recently learned methodological approach [2] and based on available topographic and hydrogeological data. The site is located to the west from the city of Snezhnogorsk at a distance of ~ 30 km ("site 354"). As it is discussed as LLW and ILW disposal, there has been suggested, for the current stage of investigation, the variant of 7-layer site model with layer thickness of 5 to 10 m. This allowed modelling of several object locations using variability principle. In particular, numerical experiments for 4 variants (6A, 6B, 6C, 5C) of solid LLW and ILW disposal site location at depth of 50m and 40m in immediate proximity to height 354 m recommended by CEG have been carried out.

The analysis of calculation results of passive tracer migration has been made in terms of dilution factor [2], thus allow in further object safety assessment to have maximally conservative values. There has been analyzed and noticed peculiarities of spatial distribution of velocity field and underground hydrosphere contamination for various disposal site location variants. Principal directions of potential contamination migration as well as dilution factors in control points have been determined. It occurred that this site is characterized by quite high dilution factor values in the upper layer of the model. Therefore, to provide environmental safety, engineering barriers of disposal must be characterized by high values of radionuclide concentration reduction factor.

In variants of disposal site location 6C and 5C, constituent comes about of tracer moving to the east (it was not noted in case of 6A and 6B), thus it can result in significant contamination of two natural water entities located at a distance of 800 m and 1400m correspondingly from the height 354m. To prevent potential contamination of environment it is possible to use, for example, curtain grouting which parameters can be determined based on mathematical modelling methods.

References

1. Sarkisov A. Problems of Implementation of the Integration Approach to Radwaste Management and Ultimate Disposal in Northwest Russia.

-http://www.iaea.org/OurWork/ST/NE/NEFW/CEG/documents/CEG_22/4_1%20Sarkisov%20Eng%20Fin.pdf

2. Amosov P.V., Novozhilova N.V. Variability of underground radiation hazardous object location. – Ecological systems and devices. – 2009. – №11. – p. 47-49.